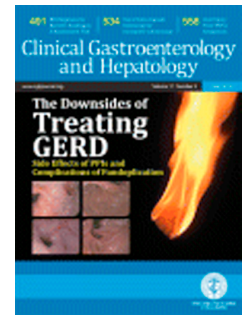


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Barriers and Facilitators to Mediterranean Diet Adoption by Patients with Non-alcoholic Fatty Liver Disease in Northern Europe

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1 **Barriers and Facilitators to Mediterranean Diet Adoption by Patients with Non-alcoholic**  
2 **Fatty Liver Disease in Northern Europe**

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Authors' contributions: LH and QMA conceived of the study, its design and co-ordination. LH participated in data collection, analysis and interpretation, as well as drafting the article. DH and EH were involved in the acquisition of data. SB, LA, KH and TH aided data analysis and interpretation. All authors revised the manuscript for important intellectual content with QMA giving final approval of the version to be published.

**Background & Aims:** Dietary interventions for weight loss are effective therapies for non-alcoholic fatty liver disease (NAFLD). The Mediterranean diet might benefit these patients but it is not followed consistently in Northern European countries. We examined factors that determine Mediterranean diet adoption and maintenance in a northern European population.

**Methods:** We used a mixed-methods approach to investigate the effects of a 12-week Mediterranean diet intervention and perceived barriers and facilitators. Nineteen adults with NAFLD were recruited from a tertiary hepatology center in England. Participants were taught behavioral strategies through the provision of shopping lists, meal planners, and recipes; no advice was given on calorie allowances or physical activities. We used the 14-point Mediterranean diet assessment tool to assess dietary intake, based on a small number of foods in servings/day or servings/week, at baseline and after 12 weeks; participants were assigned scores of low (less than 5 points), moderate (6–9 points), or high (10–14 points). Semi-structured interviews were audio recorded, transcribed, and analyzed using the framework method.

**Results:** Twelve weeks after the dietary advice, Mediterranean diet adoption significantly increased from moderate to high (mean increase of 2.2 points; from  $7.6 \pm 2.5$  at baseline to  $9.8 \pm 2.8$  at 12 weeks) ( $P = .006$ ). This increase was associated with a mean reduction in bodyweight of 2.4 kg (from  $99.2 \text{ kg} \pm 17.0$  at baseline to  $96.8 \text{ kg} \pm 17.5$  at 12 weeks) ( $P = .001$ ) and increased serum concentrations of high-density lipoprotein cholesterol in 72% of participants (from  $1.10 \pm 0.8$  at baseline to  $1.20 \pm 1.30$  vs.  $1.00 \pm 0.5$  at 12 weeks) ( $P = .009$ ). Increased nutrition knowledge and skills, family support, Mediterranean diet promotion in media and clinical settings, and the nutritional care facilitated diet changes. Barriers to Mediterranean diet uptake included an obesogenic environment, life stressors, and demand for convenience. Poor understanding of the causes and significance of NAFLD adversely affected readiness to change dietary habits.

**Conclusion:** In an analysis of patients with NAFLD the northern United Kingdom, we found a 12-week Mediterranean diet intervention was acceptable and associated with significant reductions in bodyweight and increased serum levels of high-density lipoprotein. We identified barriers and

82 facilitators that could support appropriate treatment adaptations and guide personalized  
83 intervention approaches.

84  
85 **KEY WORDS:** MDPS; HDL; metabolic liver disease; scalable diet treatments  
86

## Introduction

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Non-alcoholic fatty liver disease (NAFLD) affects up to 1-in 3-people, driving the global epidemic in chronic liver disease and consequent healthcare resource utilization (1, 2). NAFLD is a spectrum that encompasses isolated hepatic fat accumulation (steatosis, NAFL); through fat plus inflammation and hepatocyte injury (non-alcoholic steatohepatitis, NASH); ultimately to fibrosis/cirrhosis and potentially hepatocellular carcinoma (3-5). NAFLD is strongly associated with obesity and Type 2 diabetes and is an independent risk factor for the development of cardiovascular disease (CVD) (3).

Lifestyle interventions are the cornerstone of treatment in the absence of effective pharmacotherapy. The exclusion of processed food and fructose is effective and calorie restrictions to achieve 7-10% weight loss improve clinical biochemistry, histological steatohepatitis and fibrosis (6-8). The Mediterranean diet has been shown to ameliorate steatosis and improve insulin sensitivity/glucose tolerance, independent of weight loss (8-10).

The factors that determine Mediterranean diet adoption in a northern European patient population are largely unknown. There is scarce evidence on the barriers and facilitators that influence an individual's decision to adopt, and ability to maintain, such a diet long-term. There is limited information on whether an individual's understanding of their underlying liver disease contributes to the adoption of a diet intervention or their perceptions of nutritional care. These data will be highly relevant to the development of scalable diet treatments.

The aim of the current study was, firstly, to determine key barriers and facilitators to adoption and maintenance of a 12-week Mediterranean diet intervention; and, secondly, to identify which adaptations would optimize treatment delivery and so maximize dietary behavior change.

## Materials and methods

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This mixed-methods study was informed by a multi-disciplinary team comprising dietitians, psychologists and medical staff. The aim was to explore participant's experiences of following a 12-week Mediterranean diet intervention. Semi-structured interviews were conducted to identify barriers and facilitators to diet uptake and maintenance. Socio-demographic data and routinely measured clinical and lifestyle variables were collected with preliminary changes reported. The information was then integrated into the discussion of the overall results.

## Recruitment

Patients were recruited from a specialist NAFLD clinic at a tertiary hepatology center, The Newcastle upon Tyne Hospitals NHS Foundation Trust, which covers a broad geographical area in Northern United Kingdom. Eligibility criteria included capacity to provide informed written consent, and ability to write and converse in English without an interpreter. Inclusion criteria: 18-75 years old with NAFLD, weekly alcohol consumption <14/21 units in the last 24 months, non-smoker. Exclusion criteria: liver cirrhosis or neoplasm, prescribed other diet therapies, food intolerances and/or allergies. The study protocol was approved by East Midlands–Nottingham 1 Research Ethics Committee (REC reference 15/EM/0049). Informed written consent was obtained.

Patients were identified by clinicians during routine appointments and invited to participate. Overall, a purposive sample of 20 patients with diverse socio-demographics were recruited. The target sample size was informed by the researchers prior experience and other qualitative studies where data saturation is typically achieved between 12 and 20 participants (11, 12).

## Mediterranean diet intervention

Mediterranean diet intervention combined nutrition counselling and education delivered in a single-session by a dietitian. The intervention was based on the Mediterranean diet pyramid, a flexible model of dietary restraint (13). Behavioral strategies of goal setting, action-planning and self-

monitoring were targeted through the provision of shopping lists, meal planners and recipes. No advice was given on calorie allowances or physical activities. There was no further nutritional care provided over the 12 weeks, which reflects the standard follow-up interval in routine practice.

### **Quantitative data collection and analysis**

Socio-demographic characteristics included age, gender, ethnicity, weekly gross equalized household income and marital status. Although the study was not powered to detect change in outcomes, key clinical and lifestyle variables ((blood lipids, bodyweight, and body mass index (BMI)) were monitored and presented. The 14-point Mediterranean diet assessment tool (MDPS) measured diet intake based on a small number of foods in servings/day or servings/week. The range of possible scores are 0-14; low, moderate or high consumption respectively ( $\leq 5$ , 6-9 and  $\geq 10$  points) (14).

Descriptive and inferential analyses were performed in SPSS (version 22) alpha  $p < 0.05$ .

Continuous and categorical data summarized as ((mean, standard deviation (SD) and counts (percentage)). Paired t-tests were used to assess changes in clinical and lifestyle data between baseline and study end for continuous variables. Mann-Whitney U test was used to assess if clinical and lifestyle data differed by the semi-categorical diet adoption score (MDPS).

### **Qualitative data collection and analysis**

Face-to-face semi-structured interviews were completed after 12 weeks by a nutrition worker trained in qualitative research methods, audio-recorded and transcribed verbatim (interview schedule, Supplementary Material Table 1). Design and reporting was informed by consolidated criteria for reporting qualitative research (15). Reflexivity was fostered by involving multiple researchers and using a diary to record impressions of the data and analysis process.



The framework method was used for thematic analysis of the transcripts (16). Two researcher's independently coded the same 40% of transcripts to develop a working analytical framework.

These initial findings were discussed during meetings to resolve any discrepancies. This process was replicated with an additional 20% of transcripts, producing further iterations of the framework. Coding involved reading and re-reading transcripts, and coding the content into themes and subthemes until no further codes emerged.

A third researcher was consulted to refine the framework and ensure consensus was reached on themes and subthemes. This triangulation of expertise captured different perspectives and enhanced trustworthiness of the findings. The framework was then applied by indexing the remaining transcripts using the existing categories and codes, until data saturation occurred at 19 transcripts. The summarized abstracted data was charted into a matrix for each final theme. Direct participants quotes are reported to support themes and thus maximize confirmability.

## Results

One participant left the study following a major change in social circumstances, unrelated to participation so the final sample comprised 19 participants. Baseline characteristics are presented in Table 1. Median weekly gross equalized household income was £320.5 (£76.9 to £1249.9), approx. €364.7 (€87.5 to €1422.4). All participants had clinically significant NAFLD: 16 had biopsy proven NASH with Kleiner fibrosis stages ranging between F1-3. The other 3 patients had clinical and radiological evidence of NAFLD with intermediate-range NAFLD fibrosis scores ( $>-1.445$ ).

After 12-weeks diet intervention, Mediterranean diet adoption significantly increased from moderate to high levels (mean increase of 2.2 points;  $7.6 \pm 2.5$  at baseline to  $9.8 \pm 2.8$  at 12 weeks) ( $p=.006$ ) (Fig.1). In parallel, 79% of participants reduced bodyweight by mean 2.4kg (from  $99.2\text{kg} \pm 17.0$  at baseline to  $96.8\text{kg} \pm 17.5$  at 12 weeks) ( $p=.001$ ) (Fig.2). Participants with improved diet uptake (72%) had increased high-density lipoprotein (HDL) cholesterol ( $1.10 \pm 0.8$  to  $1.20 \pm 1.30$

vs.  $1.00 \pm 0.5$ ) ( $p=.009$ ). No association between diet adoption and socio-demographics were observed.

Interview data are described with participants identified by gender and age only. Figure 1 provides the analytical framework for themes, subthemes, barriers and facilitators. The links between quotes and the framework are presented (Supplementary Material Table 2).

### **NAFLD conceptualization**

Poor understanding about NAFLD appeared to influence the priority placed on following dietary advice. NAFLD was not well-defined and knowledge of the potential to induce disease regression/reduce progression was limited. Illness-related demands were perceived as lethargy, discomfort, pain, bloating, anxiety, disordered temperature regulation and altered immunity. Conversely, several reported no symptoms, or attributed symptoms to diabetes or ageing.

NAFLD causality and the strength of these associations produced responses that incorporated physiological drivers, lifestyle behaviors and genetic predisposition. The absence of alcohol in disease development was stressed. Poor diet and excess weight were often viewed as causal, and the regional cultural identity as influential. Conversely, the diet-disease relationship and impact of excess weight was questioned by a few participants.

*"I understand that if I lose weight, it might improve it. I'm struggling to be convinced by that." (F, 55 years 05)*

NAFLD specific self-care priorities and acceptance for dietary self-control was imperceptible.

Although, it was generally recognized that high-quality dietary patterns improve life expectancy and health outcomes. In some cases personal healthy dietary behaviors were shared to

emphasize that further dietary changes weren't needed. Participants were less likely to engage in the change process if they interpreted their habitual diet as either low or high Mediterranean.

*"Well, I haven't had to make many changes, so it's not been a challenge. I've just been more aware."* (F, 55 Years 05).

## **The process of dietary behavior change**

### *Readiness and psychological factors*

Placing high value on potential health benefits and the expectation of dietary enjoyment increased participants' readiness to change their habitual diet. Improved Mediterranean diet adoption was linked to responses portraying self-determination and high intrinsic motivation. Conversely, difficulties were related to perceived helplessness and increased demand for food skills.

*"Yes, I want to change; I'm finding it hard to change, but I want to change. I'm a creature of habit."* (F, 38 years)

Higher internal locus of control—belief in one's own ability to control events—assertiveness and a balanced relationship with food supported diet modifications. Stressful experiences, ambivalence and optimistic bias hindered the process. High responsiveness to cues outside of hunger, resulting in treats, cheats or rewards were obstacles to following dietary advice. Attitudes diverged on whether it was feasible to consume Mediterranean diet across seasons.

*"When I left work this afternoon I walked into the administration office I saw the big bag of Maltesers® there made up of little bags. I know I shouldn't, but I did."* (M, 59 years)

*"Then Christmas came in the middle of it, and Christmas just isn't geared up for the Mediterranean diet, really, is it?"* (F, 38 years)

248 Mediterranean diet intervention was highly acceptable to many participants with impressions of  
249 food abundance, variety and enjoyment. The cost of Mediterranean diet ingredients did not  
250 emerge as an obstacle to participants following this dietary pattern. Portion sizes were typically  
251 considered adequate and a range of individual Mediterranean foods were consumed. Enhanced  
252 nutrition knowledge/skills and self-regulation supported diet uptake.

253  
254 *"I'm just amazed at how much fruit and vegetables you can buy for quite a low amount of money."*  
255 *(M, 59 years)*

256  
257 Participants encountered difficulties with an obesogenic environment and a societal pressure to  
258 consume. The unhealthy selections available in institutions, workplaces and supermarkets  
259 negatively impacted diet maintenance. Work patterns and dietary habits were problematic for  
260 appetite regulation and food routines. In contrast, easy access to budget supermarkets, good  
261 transport links and having family diet supporters were regarded positively.

262  
263 *"I always bring my food with me, which makes me look a bit like an outsider. So, I have to fight my*  
264 *corner." (F, 55 years 05)*

## 266 **Dietary management**

267 Personalized approaches combining nutrition education and counselling skills induced diet  
268 modifications. The dietitian was considered an advocate of flexible dietary restraint and the  
269 Mediterranean style of eating. The importance of role modelling and credibility was identified.  
270 Participants reported food selections based on therapeutic benefits with nutritional quality,  
271 freshness and palatability. However, taste preferences were a clear barrier in some cases and  
272 sustained dietary changes also appeared dependent upon improvements in clinical parameters.

79% of participants achieved weight reduction. These individuals largely perceived the adoption of the diet as more feasible, conveying a greater magnitude of dietary changes.

(F, 55 years 04) reduced her weight by 5.6kg and said *"I would want them to know it's really easy. It's very enjoyable, and a variety of foods." "There is enough food you can eat."*

Conversely, in those cases where weight loss was not attained, difficulties applying dietary changes were more often reported.

(F, 38 years) gained 2.3kg and stated *"What I found hard was, because I rely quite a lot on convenience, preparing everything from scratch, you weren't able to just grab something and go you had to think about it."*

### **Treatment adaptations**

Measures to shape future diet interventions were suggested, such as joint creation of resources and personalized dietary input on a quarterly basis. Face-to-face contacts were preferred with support from an online program, thus enabling housebound patients and those from a wider geographical area to engage. Telephone contacts appeared to be least helpful and groups cost-effective and motivating. Mediterranean diet promotion in clinical settings and increased coverage in books and television facilitated diet uptake.

### **Discussion**

The Mediterranean diet is widely studied and has beneficial properties in a broad range of diseases (17, 18). The PREDIMED study reported that high Mediterranean diet adoption (MDPS  $\geq 9$ ), was associated with significantly lower odds ratios for obesity prevalence and CVD risk. Furthermore, a 2-point increase in MDPS was associated with reduced risk of ill-health (19, 20). Our results are consistent with emergent evidence within the NAFLD population (21).

Mediterranean diet adoption significantly increased and was associated with modest but significant bodyweight reduction and increased HDL-cholesterol in participants. These findings suggest this dietary pattern alongside other lifestyle changes contribute to an improved CVD risk profile in NAFLD patients.

Perhaps unsurprisingly, Mediterranean diet consumption was lower in the study population (MDPS  $7.6 \pm 2.5$ ) than in a Mediterranean population (MDPS  $8.7 \pm 2.0$ ) (20). Accordingly, Mediterranean diet interventions outside the Mediterranean region may face additional challenges and warrant specific approaches. Interestingly, we identified no association between socio-demographic characteristics at baseline or end-of study MDPS, though the ability to detect associations may have been impeded by small numbers.

## **Barriers and facilitators of Mediterranean diet adoption and maintenance**

### **NAFLD conceptualization**

Acceptance of NAFLD as a disease and nutritional care engagement is impacted by patients understanding of their condition. Poor health service utilization may be in part attributed to lack of symptoms, and viewing long-term diseases and their outcomes as inevitable (22, 23). Therefore, clinicians should stress that NAFLD is treatable and even reversible if diet improvements are sustained (6). Perceived stigma in obesity and liver disease poses psychological burden. In this study, the absence of alcohol in NAFLD causality, social desirability and optimistic bias was emphasized.

### **Readiness and psychological factors**

Participants readiness to change, underpinned diet adoption and maintenance with low intrinsic motivation and ambivalence obstacles to following dietary advice. This is consistent with recent findings that willpower and willingness to change affect healthy eating adoption (24-26). Self-efficacy is one of the best psychological predictors of good outcomes in lifestyle interventions that

target obese adults, but is low in NAFLD patients compared to other liver disease patients (27, 28).

Self-regulation and higher autonomous motivation have been found to be positive predictors of diet adherence in obesity interventions, which is in line with our findings (29). The negative impact of treats or rewards, and life stressors were evident and appear common in interventions targeting obese adults (28). Thus, having a balanced relationship with food is pivotal to success as well as the ability to manage moods, emotions and stressors.

### **Dietary management**

Tangible markers of weight loss, improved glycemic control and well-being expedited diet maintenance. Our data supports the view that individuals with weight loss found the adoption of the diet more straightforward, as evidenced by the diet modifications reported. Published data indicates early weight loss is a prominent predictor of treatment adherence among obese patients and subsequent weight loss (28, 30). Trust in the dietitian–patient relationship encompassing; professional credibility; role modelling; and diet advocacy induced changes. Participants want effective personalized interactions and not standardized approaches.

Nutrition knowledge was significantly associated with Mediterranean diet adherence and lower obesity prevalence among the Molise population, Italy (MOLI-SANI study) (31). Nutrition counselling interventions have also been shown to induce moderate diet improvements previously (32). Hence, nutrition education and counselling are crucial ingredients in diet interventions.

Although, more intensive approaches may have greater effectiveness than brief interventions (24).

### **Practical and social factors**

One of the most significant findings in our study is that the Mediterranean diet is an acceptable healthy eating model in a non-Mediterranean country (24, 33). There were impressions of cost

neutrality, despite the study population having a mean weekly household income that is £227.4, approx. €258.8 lower than the UK average (34). Furthermore, previous research found diet changes did not equate to significantly increased purchase costs (1-point increase MDPS equivalent to £0.55) (24), which is supported by published cost analysis (35, 36).

Commitment to a diet intervention amongst other obligations appears demanding. Diet saboteurs and spousal conflict impacted the home environment to undermine food routines. Consistent with our data, research that examined barriers to healthy eating adoption also identified time pressures, busy lifestyle, irregular working hours and desire for convenience (37).

### **Treatment adaptations**

The various treatment adaptations suggested underscores the futility of a one-size-fits-all approach. The joint development of intervention tools between patients and clinicians may optimize treatment adoption and maintenance. Personalized dietary input on a quarterly basis combined with an online program was also favored. Earlier intervention studies have used these components effectively (38).

The MOLI-SANI study reported that exposure to mass media information was significantly associated with greater adoption of a Mediterranean-style diet (41). Furthermore, that participants found increased coverage in media, books, magazines and television induced dietary behavior change, which is consistent with our findings.

The main limitation of the current study is potential for selection bias, with participants perhaps more health-motivated and interested in the diet intervention, which might not be applicable to the wider NAFLD population. However, steps were taken to address transferability by recruiting a purposive sample of individuals with diverse socio-demographics and making connections to the regional cultural and social context. Further larger studies are needed to assess Mediterranean



diet uptake and its impact in a larger population. Another limitation was that a detailed assessment of Mediterranean diet impact on markers of liver function was not conducted. However, this study primarily focused on identifying barriers and facilitators to a Mediterranean diet in patients with NAFLD, rather than assessing its impact on the liver, which has already been subject to a controlled trial (9). The sample size may be considered small in an epidemiological context, but was sufficiently robust to achieve the aims of this mixed-methods study.

Despite these limitations, this study adds to the body of literature indicating that a Mediterranean diet was highly acceptable, and its adoption was associated with positive clinical outcomes. The findings provide simple ways in which clinicians can optimize patient consultations in clinical practice. This study is the first to explore the factors that influence Mediterranean diet adoption in a northern European NAFLD patient population and demonstrates its potential to be translated in regions that consume a typical western diet. Importantly, no specific advice on calorie allowances or physical activities was given during the intervention and this still led to positive effects on bodyweight and HDL levels.

A 12-week Mediterranean diet intervention was acceptable in NAFLD patients and was associated with positive changes in bodyweight and serum HDL levels. The Mediterranean diet intervention effectively modified diet adoption and maintenance in a northern European patient population. Furthermore, during dietary intervention we identified a range of perceived barriers and facilitators, which may enable a more targeted and personalized intervention approach. Treatment adaptations to enhance personalized nutritional care were highlighted alongside the benefits of sustained exposure to Mediterranean diet information in media and clinical sources.

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**Table 1. Baseline characteristics of Mediterranean diet population. Values are means (SD).**

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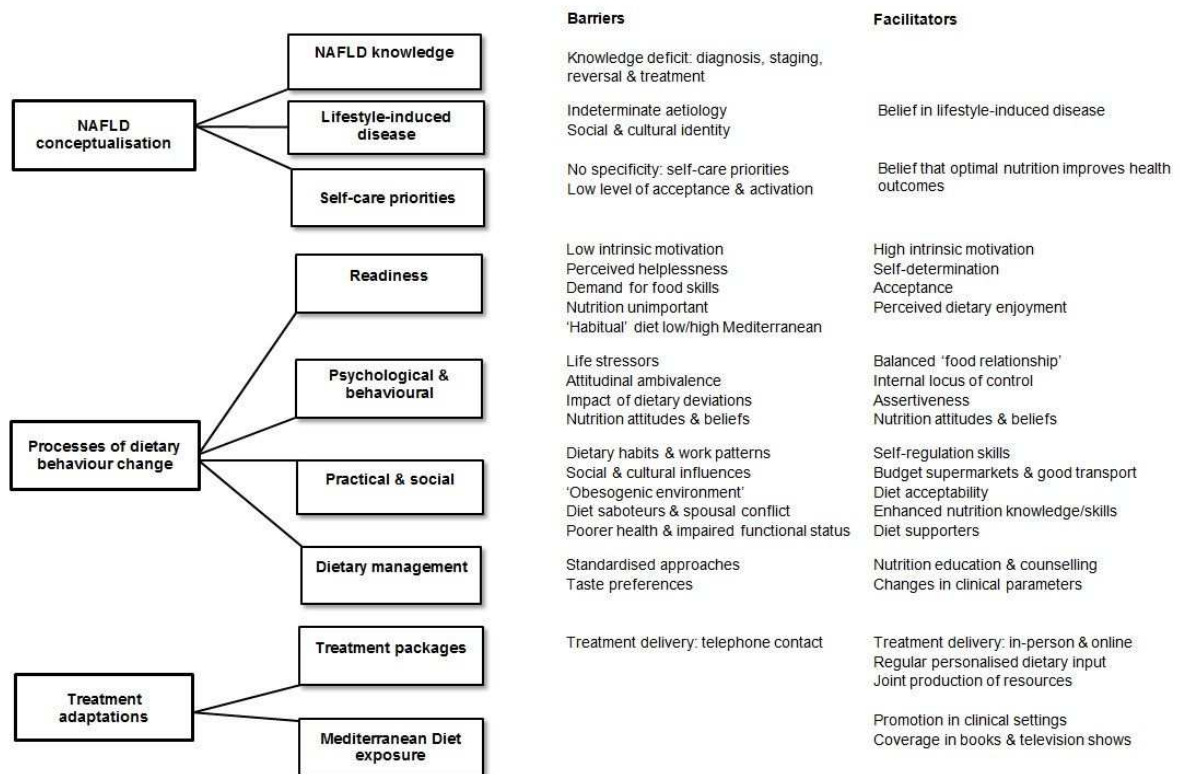
Variable	Mean (SD), n=19
Gender (% Female)	63.2
White British (%)	89.4
Age (years)	58.5 (10.6)
Married or cohabiting (%)	78.9
Type II diabetes (%)	68.4
Weight (kg)	99.2 (17.0)
BMI (kg/m <sup>2</sup> )	36.2 (6.3)
≤30	5.3%
30-34.9	47.4%
35-39.9	26.3%
≥40	21%
MDPS (<5, 6-9, >10)	7.6 (2.5)

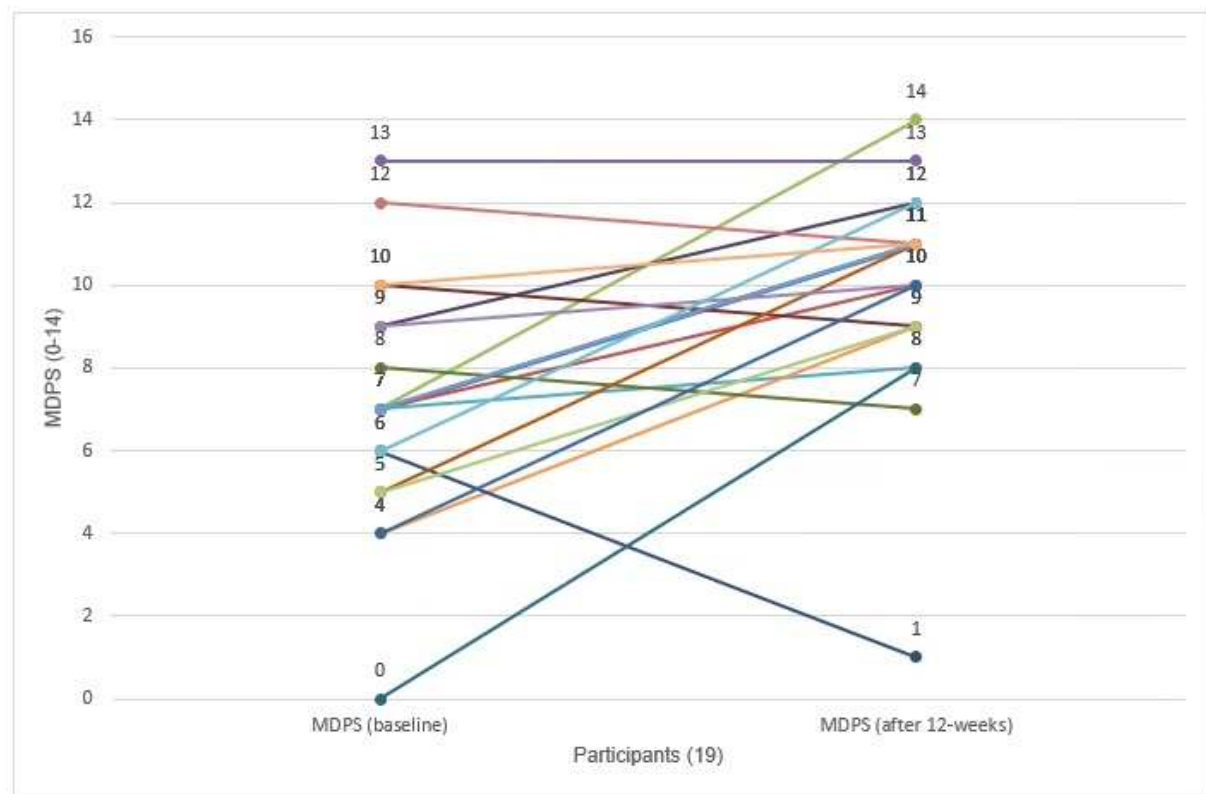
**Fig.1. Themes, subordinate-themes, barriers and facilitators**

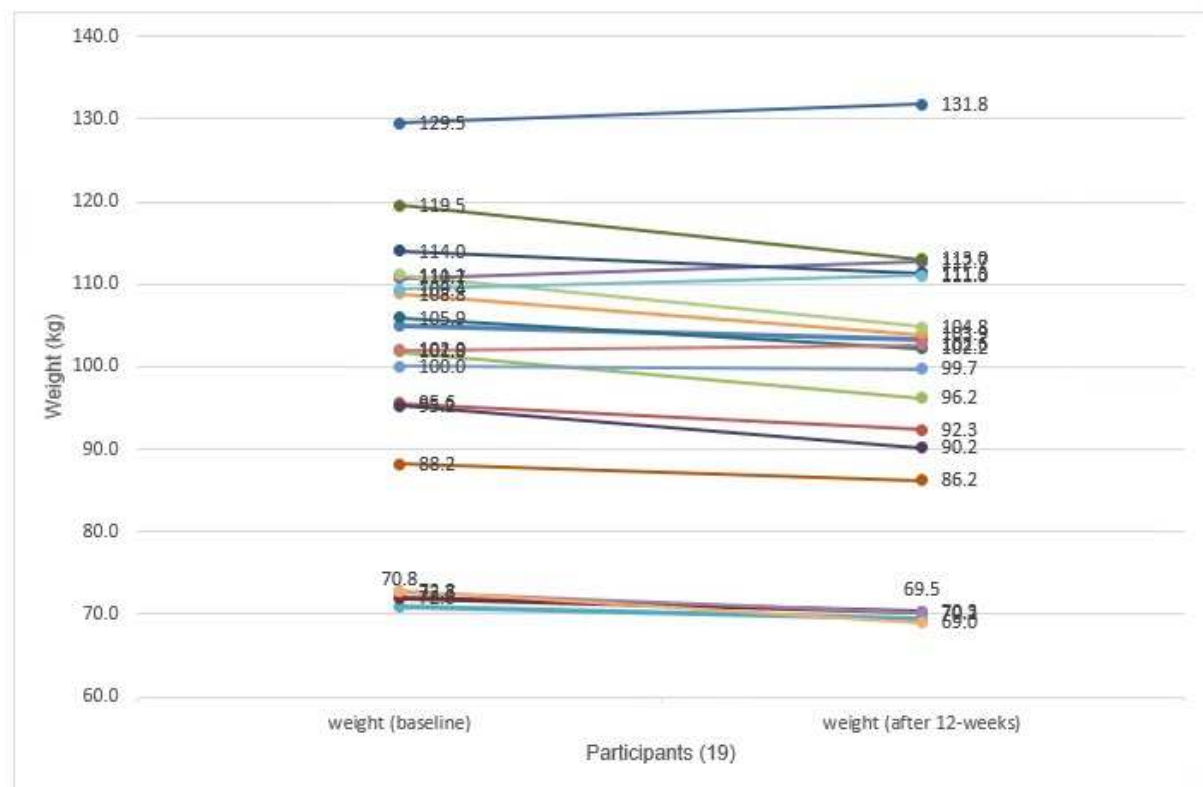
**Fig. 2. Mediterranean diet adoption at baseline and after 12-weeks diet intervention.**

Significance:  $p=.006$  (paired t-test)

**Fig. 3. Bodyweight at baseline and after 12-weeks diet intervention.** Significance:  $p=.001$   
(paired t-test)









## What You Need to Know

### Background

- The Mediterranean diet may be beneficial in non-alcoholic fatty liver disease (NAFLD).
- Information on the factors that determine Mediterranean diet adoption and maintenance in a northern European population is scarce.

### Findings

- A 12-week Mediterranean diet intervention is an acceptable approach and its adoption associated with positive clinical outcomes.
- A range of key barriers and facilitators to Mediterranean diet adoption were identified. Knowledge of these could support a more targeted and personalized intervention approach.

### Implications for patient care

- Characterizing barriers and facilitators of Mediterranean diet consumption may be a useful strategy to tailor diet interventions, in regions that consume a typical western diet.

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# Barriers and Facilitators to Mediterranean Diet Adoption by Patients with Non-alcoholic Fatty Liver Disease in Northern Europe

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**Table 2. Interview schedule**

Perceptions of NAFLD and its management	Prompts
Please tell me, what do you understand about non-alcoholic fatty liver disease (NAFLD)?	
Please describe, in what ways does NAFLD affect you?	Is there anything that you have changed in your daily life because of the condition? Why?
Perceptions of Mediterranean Diet	
On a scale of 0-10, how important is what you eat and drink to you? (where 0 = not very and 10 = very)	How do you feel about changing your diet to manage the condition?
If you were advising a friend about how to follow a Mediterranean diet, what would be the key points you would want them to know?	What are the potential health benefits? What do you see as advantages/disadvantages? What are the priorities when choosing foods/drinks?
How did following a Mediterranean diet compare with your expectations? Easier or harder?	Why?
Please tell me has changing your diet affected those close to you?	And if so in what ways?
Can you describe what has helped you to follow a Mediterranean diet?	How does that work? What has worked out best so far and why?
Is there anything that might stop other people from following a Mediterranean diet?	And if so what are these? Was that a problem for you? Was there anything you found difficult? Did anything get in the way?
On a scale of 0-10 how confident are you about being able to follow a Mediterranean diet in the long-term? (where 0 = not very and 10 = very)	

# **Perceptions of dietary management**

Can you think about the most useful Mediterranean diet information you learned? What made it particularly helpful?	
Can you recall the dietary information given to you in clinic? What was the most helpful?	Was goal setting useful or difficult? Was diary keeping helpful/easy to do or difficult?
Do you have any suggestions about how we can make it easier for people to follow a Mediterranean diet?	At clinic and at home?
Would you like to receive further advice about a Mediterranean diet?	From whom? Which topic(s)?
How would you like to receive this further advice?	Individually or in a group?  How often?  Face-to-face?  Telephone?  Web-based support?
And, finally, is there anything else you want to tell me about your experience of following a Mediterranean diet?	

**Table 2. Thematic framework and illustrative quotations**

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<b>1.0 Theme: NAFLD conceptualization</b>	
<b>1.0a</b> NAFLD-related knowledge	<ul style="list-style-type: none"> <li>• “I don’t know how bad it is, I don’t know what happens next.” (F, 54 years)</li> <li>• “I don’t really know what the effects of non-alcoholic fatty liver disease are, because I associate any symptoms that I have to diabetes, which is tiredness, lethargy – things like that.” (F, 62 years)</li> <li>• “We are both getting older, so we do have other health problems. So, we can’t really say that it’s connected with non-alcoholic fatty liver disease.” (M, 77 years)</li> </ul>
<b>1.0b</b> Lifestyle-induced disease	<ul style="list-style-type: none"> <li>• “The first thing I can tell you is that it’s complicated, that I understand I developed it because I’m diabetic, mostly.” (F, 55 years 05)</li> <li>• “Obviously, you can only go down to a regular weight for your liver. If that still doesn’t do it, then I presume it’s genetic.” (F, 56 years)</li> <li>• “I’m very overweight and I have been for, probably about 20 years, and that, obviously, didn’t help my liver.” (F, 55 years 04)</li> <li>• “Er. Well, I know it’s nothing to do with alcohol and that sort of thing.” (M, 66 years)</li> </ul>
<b>1.0c</b> Self-care priorities	<ul style="list-style-type: none"> <li>• “The other thing I found, when I was doing this, when I did lose the weight, was my blood sugar dropped, so there are obviously advantages there as well.” (M, 60 years)</li> <li>• “I mean, the one thing that does help me is the fact that I have got a disease. I know that I need to try and do something about it.” (M, 59 years)</li> <li>• “It’s an acceptance that this is where we are and we have to face it. I think just the fact that I know now that there is nothing that can be done for my condition except changing the way I eat.” (F, 69 years)</li> </ul>
<b>1.1 Theme: The processes of dietary behavior change</b>	
<b>1.1a</b> Readiness	<ul style="list-style-type: none"> <li>• “I know I should, and I do try. Sometimes I might fall by the wayside, but we’re all human. Long term? It depends on my motivation. If I can see that it’s having a good impact, then I’m probably quite high up that scale.” (F, 62 years)</li> <li>• “Er. I don’t know. My wife goes out and gets all the stuff, you know, so. She does the shopping and cooking and that, and all I do is just eat it.” (M, 66 years)</li> <li>• “Relatively easy. If they’re committed to it in some kind of way.” (M, 59 years)</li> </ul>



<p>Family support</p>	<p>more servings of vegetable? And, the shock-horror, you know?" (F, 56 years)</p> <ul style="list-style-type: none"> <li>• "One son has got me going, on a Sunday morning, and doing a park run, which I would never have envisaged me doing before. And my other son, who is a chef – well, not a chef but he's a cook – he's now helping with that side of things: he's making up recipes that are really good for me to have." (F, 55 years 04)</li> <li>• "My wife and my daughters will test out recipes I have a supportive environment around me. They were scrutinized by my food government at home. Both of my daughters will look at the contents of food, food labelling stuff." (M, 59 years)</li> <li>• "It's made him realize that I suddenly have an opinion and I've got to do something for me. Overall it's been quite fun because, as I say, I like learning new things. But, at the same time it has caused a certain amount of stress at home." (F, 69 years)</li> </ul>
<p>1.1d Dietary management</p> <p>Food and drink selections</p>	<ul style="list-style-type: none"> <li>• "I think she believed in it and it made us, it came across that it's pointless doing something or getting somebody to do it if you don't believe it yourself." (F, 52 years)</li> <li>• "I would tell them just the thing Laura showed us, with the plate size, and how it was divided up, which was very important because when you go off that guideline, you know what you're eating and it's balanced." (F, 52 years)</li> <li>• "When I started on it, I had the one-on-one with Laura, and that was really good for portion sizes, because that is where I was falling down. She made it properly tactile; you could have a handful of whatever, and that was your portion size and, rather than just getting told you need a portion of this, and a portion of that, it's good to see it, because you can really visualize it. Then, when you go round the supermarket, you think, 'that's two portions in there', and you know what you're buying." (F, 38 years)</li> <li>• "I think it was the dietitian going through it at the beginning. You know, pointing out the reasons, and then obviously giving you some support recipes. That was quite useful. It was interesting to find out about lentils and nuts and things, because I had always thought, keep well off those because they are full of calories." (F, 56 years)</li> <li>• "The fact that people in the Mediterranean don't suffer so much with liver disease, given the fact that they are living using fresh vegetables, and I know they don't use processed foods at all." (F, 62 years)</li> </ul>

Taste preferences	<ul style="list-style-type: none"> <li>• “To change to olive oil, definitely and to eat more pulses. That has been the two big things for me. Now, I’m really eating much more vegetables, so I go for vegetable dishes more than meat (F, 54 years)</li> <li>• “Don’t use butter; use olive oil, eat loads of fruit and veg; that’s the main thing.” (F, 61 years)</li> <li>• “It would revolve around fresh fruit, fresh vegetables, actually cooking rather than takeout. Trying as far as possible to avoid processed food. (M, 59 years)</li> <li>• “Priorities are to try and keep within the guidelines of the Mediterranean Diet, and try not to consume as much red meat as I did; more on the chicken, turkey side of things.” (M, 60 years)</li> <li>• “Preparing everything fresh, and not going for the convenience.” (F, 38 years)</li> <li>• “There was a lot of stuff that I wouldn’t eat, and I wouldn’t, you know, wouldn’t look at really food-wise. (M, 66 years)</li> <li>• “But I found it rather hard because I’m not a pasta eater.” (F, 65 years)</li> <li>• “The disadvantages, I would say, are there’s lots of things that, me, personally, I don’t like; the beans, pulses, I’m not a great lover of them. I’m not a great salad eater.” (M, 60 years)</li> </ul>
<b>1.2 Theme: Treatment adaptations</b>	
<b>1.2a</b> Treatment packages	<ul style="list-style-type: none"> <li>• “I think a bit more advice about takeout meals or going into a restaurant, you know pub meals?” (F, 69 years)</li> <li>• “I think it would be good if there was some sort of online resource that you could tap into. I got a set of recipes to begin with, but, if there was a library that, if you’re struggling for ideas, you could just go to. That would be really useful, I think; probably would keep the motivation going a bit.” (F, 38 years)</li> <li>• “Web-based is good because you do it in your own time. If it’s online it could be whenever you want to know, really – on a ‘need to know’ basis. (F, 55 years 05)</li> <li>• “Just more recipes; practical recipes and extra resources once a month.” (F, 56 years)</li> <li>• “I wonder if it would help giving people prices of things, preparing prices or saying to folk, “Look, this is what you spend when you get your takeout’s” “So maybe some</li> </ul>



	<p>easy accessible resources.” (M, 59 years)</p>
Groups	<ul style="list-style-type: none"> <li>• “It’s good to have, like, a group session because you can give each other support, and it also motivates you to follow it more closely, because if your weight and, you know, waist measurements and what-have-you are shared with a group of people, you’re more motivated.” (F, 62 years)</li> <li>• “Groups could be fun – I think fun is important. Groups are probably more cost-effective. Maybe some classes on how to experiment with food, having a bit of confidence, really improve people’s perceptions. I think that would make a big difference. I wouldn’t want to commit myself, I just haven’t got enough time. I would love to have the time to do something like that.” (F, 55 years 05)</li> </ul>
Joint creation of resources	<ul style="list-style-type: none"> <li>• “The only thing I could think of is maybe if there was a recipe that we thought about, it could be included. Like my husband’s vegetable soup – he tells everybody about it” (F, 55 years 04)</li> </ul>
<b>1.2b</b> Mediterranean diet promotion	<ul style="list-style-type: none"> <li>• “I think it’s a good idea, a very good idea, but I think it needs promoting a lot more, than what it’s actually promoted at the moment. You read about all these other diets, and I think this one has benefits, but it’s not out there, in your face, like all these other things. It’s advertised but I don’t think it’s as well-known as it should be. I think your waiting room is a prime example; there’s not one thing in your waiting room referring to the Mediterranean Diet. That and hand-outs, even bits on the tables.” (M, 60 years)</li> <li>• “It was all the Mediterranean Diet, all in the Daily Express (F, 62 years)</li> <li>• “I’ve been buying books and magazines with Mediterranean diet and watching the programs on the television with Michael Mosley and the team.” (F, 69 years)</li> </ul>